3. ENVIRONMENTAL PROGRAM INFORMATION

3.1 SUMMARY

Ohio EPA concurred with the records of decision for the process buildings and waste disposition in 2015. The record of decision for the process buildings and other facilities selected controlled removal of stored waste and materials, demolition of the buildings or structures, and characterization of materials for disposal or disposition (DOE 2015b). The record of decision for waste disposition selected a combination of on-site and off-site disposal (DOE 2015c), which includes construction of an OSWDF. The following activities continued throughout 2019: 1) removal of materials from the process buildings, 2) on-site staging or off-site reuse, recycling, or disposal of D&D materials in compliance with the records of decision, and 3) construction activities for the OSWDF.

Soil and groundwater is being investigated and remediated, if necessary, as part of the Environmental Restoration Program at PORTS. Ohio EPA approved the *Deferred Units RCRA Facility Investigation/Corrective Measures Study Work Plan for Solid Waste Management Units* in 2015 (DOE 2015a). This work plan was developed to investigate "deferred units" at PORTS. Deferred units are designated areas located in, or adjacent to, the gaseous diffusion production and operation areas. Remedial activities in these areas would have interrupted ongoing operations, or ongoing operations could have resulted in recontamination of the areas. Soil and groundwater sampling in the work plan started in 2015 and was completed in 2016. The *Deferred Units RCRA Facility Investigation/Corrective Measures Study Report* (DOE 2017a) was submitted to Ohio EPA in 2017. Ohio EPA reviewed the report and submitted comments to DOE in December 2018. DOE worked to address these comments, which included additional sampling and installation of additional monitoring wells, throughout 2019.

In 2019, FBP shipped approximately 2051 tons of waste or other materials to off-site facilities for treatment, disposal, recycling, or reuse. Activities undertaken by the Environmental Sustainability and Public Awareness programs are also discussed in this chapter.

Chapter 2, Section 2.3.6, provides information on implementation of the DOE EMS at PORTS.

3.2 D&D PROGRAM

On April 13, 2010, Ohio EPA issued the D&D DFF&O, which is an enforceable agreement between Ohio EPA and DOE that governs the process for D&D of the gaseous diffusion process buildings and associated facilities that are no longer in use at PORTS. The D&D DFF&O was revised in 2011 and 2012 to add structures that were inadvertently omitted from the original orders. The D&D DFF&O, which applies to the D&D of buildings down to and including the building slab and disposal of wastes generated by D&D, uses the CERCLA framework for determining appropriate removal and remedial actions. Documents are submitted to Ohio EPA for either concurrence or approval. Chapter 2, Section 2.3.1.1, provides additional information about the D&D DFF&O.

Public open houses in neighboring communities are held to keep the public informed and to receive their questions and comments. The PORTS Site Specific Advisory Board, comprised of local citizens, provides recommendations to DOE based on the concerns of the communities surrounding PORTS. Section 3.6 provides additional information on the PORTS Public Awareness Program.

3.2.1 Process Buildings and Other Facilities

D&D of the process buildings and other facilities at PORTS is proceeding in accordance with the record of decision for process buildings concurred with by Ohio EPA in 2015 (DOE 2015b). The record of decision includes:

- Demolition of the buildings or structures;

- Characterization and demolition of underground man-made features;
- Treatment as needed to meet transportation and disposal requirements (either on-site or off-site disposal);
- Packaging of generated waste for final disposal (either on-site or off-site disposal); and
- Transportation and disposal of the waste in accordance with the waste disposition record of decision (either on-site or off-site disposal).

The Process Buildings Deactivation Remedial Design/Remedial Action Work Plan (RD/RA Work Plan) (DOE 2016b) was developed by DOE and concurred with by Ohio EPA in 2016. Another RD/RA Work Plan, the Comprehensive Deactivation, Demolition, and Disposition RD/RA Work Plan for the Process Buildings and Complex Facilities (DOE 2018a), was prepared by DOE and concurred with by Ohio EPA in 2018 which included deactivation, demolition, and waste disposition activities. These two RD/RA Work Plans provide the information to demonstrate that deactivation activities to prepare the three main process buildings along with their associated support structures and also the other complex facilities for demolition meet the requirements of the D&D DFF&O, the Process Buildings and Waste Disposition records of decision, and other applicable requirements. Activities underway in 2019 included disassembly and removal of equipment, removal of wastes including asbestos, PCBs, and RCRA hazardous waste, and deactivation of utilities and other systems. Materials that did not meet criteria for on-site disposal at the OSWDF were shipped off site for disposal in accordance with applicable regulations.

3.2.2 Site-wide Waste Disposition

The record of decision for site-wide waste disposition was concurred with by Ohio EPA in 2015 (DOE 2015c). The record of decision selected a combination of on-site and off-site disposal, including construction of an OSWDF.

Figure 3.1 shows the location of the planned OSWDF in the northeast portion of PORTS. Site construction activities, which began in 2015, initially included tree clearing, grading, and installation of fencing, roadways, utilities, office trailers, erosion controls, sedimentation ponds, and other areas. Activities in 2019 were performed in accordance with the Comprehensive OSWDF RD/RA Work Plan (DOE 2018b). Installation of the primary liner for the first landfill cell was completed in 2019. Work continued on installation of the leachate transmission piping and valve houses as well as other support areas.

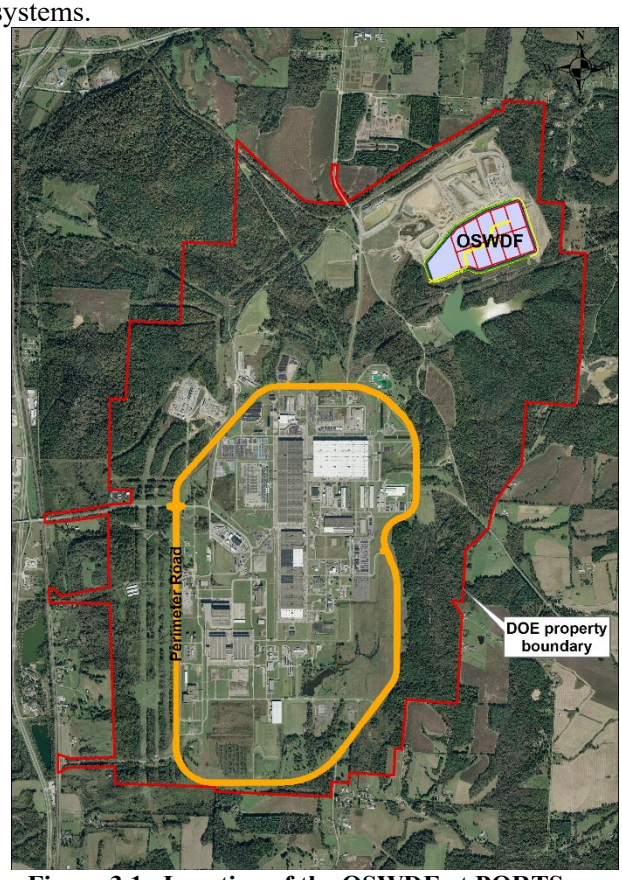

Figure 3.1. Location of the OSWDF at PORTS.

The OSWDF Final (100%) Design Package, which consisted of 11 separate documents, was submitted to Ohio EPA in November 2018. Ohio EPA reviewed and concurred with all of the documents in the Design Package in 2019 and 2020.

3.3 ENVIRONMENTAL RESTORATION PROGRAM

DOE established the Environmental Restoration Program in 1989 to identify, control, and remediate environmental contamination at PORTS. Environmental restoration has been conducted in accordance with the RCRA corrective action process, under a Consent Decree with the State of Ohio, issued on August 29, 1989 and a U.S. EPA Administrative Order by Consent, issued on September 29, 1989 (amended in 1994 and 1997 and terminated on February 13, 2017). With implementation of D&D, removal of facilities and structures down to and including the building slab is controlled by the D&D process (see Section 3.2). Investigation and remediation of environmental contamination is completed under the RCRA corrective action process and in accordance with the Consent Decree with the State of Ohio.

In general, the RCRA corrective action process consists of the following:

1) an assessment to identify releases of hazardous waste and hazardous constituents and determine the need for further investigation (the RCRA facility assessment),

2) an investigation to determine the nature and extent of any contamination (the RCRA facility investigation), and

3) a study to identify and evaluate remedial alternatives to address contamination (the corrective measures study).

Following the approval of the final corrective measures study, Ohio EPA selects the remedial alternatives that will undergo further review to determine the final remedial actions (the statement of basis, formerly called the preferred plan). Upon completion of the public review and comment period, Ohio EPA selects the final remedial actions. Ohio EPA issues a decision document to select the final remedial actions and the remedial actions are implemented by DOE. Final remedial actions are reviewed by Ohio EPA on a schedule agreed upon by Ohio EPA and DOE (approximately every five years) to ensure that the remedial actions are performing as intended by the decision document and are protective of human health and the environment.

The initial assessment and investigation of PORTS under the RCRA corrective action process was completed in the 1990s. Because PORTS is a large facility, it was divided into quadrants (Quadrant I, II, III, and IV) to facilitate the cleanup process (see Chapter 6, Figure 6.1). Remedial actions have been implemented in each of the PORTS quadrants.

Some RCRA corrective action investigations were deferred to the start of D&D activities at PORTS and are now underway. When the RCRA corrective action process began at PORTS during the 1990s, deferred units were designated areas located in, or adjacent to, the gaseous diffusion production and operation areas. Remedial activities in these areas would have interrupted ongoing operations, or ongoing operations could have resulted in recontamination of the areas. Ohio EPA deferred investigation/remedial action of soil and groundwater associated with these units until D&D of PORTS (or until the area no longer met the requirements for deferred unit status). Ongoing environmental monitoring and on-site worker health and safety programs monitor the contaminants in these areas prior to D&D.

The *Deferred Units RCRA Facility Investigation/Corrective Measures Study Work Plan* was approved by Ohio EPA in 2015 (DOE 2015a). Soil and groundwater sampling in the work plan started in 2015 and was completed in 2016. The *Deferred Units RCRA Facility Investigation/Corrective Measures Study Report* (DOE 2017a) was submitted to Ohio EPA in September 2017. Ohio EPA submitted comments to DOE in December 2018. DOE worked to address these comments, which included additional sampling and installation of additional monitoring wells, throughout 2019.

The following sections describe the remedial actions underway in each quadrant as well as ongoing activities at any formerly deferred units. Table 3.1 lists remedial activities for the groundwater monitoring areas at PORTS, which include remedial actions required by decision documents and other actions.

3.3.1 Quadrant I

The *Quadrant I Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 2000 (DOE 2000). Ohio EPA issued the Decision Document for Quadrant I in 2001, which provided the required remedial actions for the X-749/X-120 groundwater plume and the Quadrant I Groundwater Investigative (5-Unit) Area (the Five-Unit Groundwater Investigative Area and X-231A/X-231B Oil Biodegradation Plots) (Ohio EPA 2001).

Remedial actions required for the X-749B Peter Kiewit Landfill (PK Landfill) were provided in separate Decision Documents issued by Ohio EPA in 1996 (Ohio EPA 1996a) and U.S. EPA in 1997 (U.S. EPA 1997). The following sections discuss the remedial actions required for the X-749/X-120 groundwater plume, PK Landfill, and the Quadrant I Groundwater Investigative (5-Unit) Area. Chapter 6 provides 2019 groundwater monitoring results for the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility, (Section 6.4.1.3 and Figure 6.2), PK Landfill (Section 6.4.2.1 and Figure 6.2) and Quadrant I Groundwater Investigative (5-Unit) Area (Section 6.4.3.1 and Figure 6.3).

3.3.1.1 X-749/X-120 groundwater plume

The remedial actions identified for X-749/X-120 groundwater plume (see Chapter 6, Figure 6.2) include phytoremediation of the groundwater plume, installation of a barrier wall around the eastern and southern portion of the X-749 Landfill, and continued operation of the groundwater collection trenches installed at the PK Landfill and X-749 Landfill. In addition, groundwater extraction wells were installed in 2007, 2008, and 2010 to control migration of the plume and remediate areas of higher trichloroethene (TCE) concentrations within the plume.

Phytoremediation is a process that uses plants to remove, degrade, or contain contaminants in soil and/or groundwater. Phytoremediation at the X-749/X-120 groundwater plume was installed in two phases during 2002 and 2003. The barrier wall around the eastern and southern portion of the X-749 Landfill was completed in 2002.

The *First Five-Year Review for the X-749/X-120 Groundwater Plume*, submitted to Ohio EPA in 2011, found that the remedial actions implemented for the X-749/X-120 groundwater plume (both the remedial actions required by the Decision Document and the extraction wells installed in 2007 and 2008) were achieving remedial action objectives by preventing migration of contaminants from the X-749 Landfill and controlling migration of the X-749/X-120 groundwater plume (DOE 2011c). However, Ohio EPA and DOE agreed that the phytoremediation system was not as successful as anticipated in reducing concentrations of TCE in groundwater. The extraction wells that began operating in 2007-2008 in the groundwater collection trench on the southwest side of the X-749 Landfill and the X-749 South Barrier Wall Area, as well as the barrier wall on the south and east sides of the landfill (completed in 2002), appeared to be primarily responsible for the reductions in TCE concentrations within the X-749/ X-120 groundwater plume. Maintenance of the phytoremediation system was discontinued with the approval of Ohio EPA in 2011.

Table 3.1. Remedial actions at PORTS in groundwater monitoring areas

Quadrant/monitoring area	Remedial action/year completed
Quadrant I X-749/X-120 groundwater plume	X-749 multimedia cap – 1992 X-749 barrier wall (north and northwest sides of landfill) – 1992 X-749 subsurface drains and sumps – 1992 South barrier wall – 1994 X-120 horizontal well – 1996 X-625 Groundwater Treatment Facility – 1996 X-749 barrier wall (east and south sides of landfill) – 2002 Phytoremediation (22 acres) – 2002 & 2003 Injection of hydrogen release compounds – 2004 X-749 South Barrier Wall Area extraction wells – 2007 Two additional extraction wells in the groundwater collection trench on the southwest side of the X-749 Landfill – 2008 X-749/X-120 groundwater plume extraction wells – 2010
Quadrant I Peter Kiewit (PK) Landfill (X-749B)	Relocation of Big Run Creek – 1994 Groundwater collection system – 1994 Groundwater collection system expansion – 1997 PK Landfill Subtitle D cap – 1998
Quadrant I Quadrant I Groundwater Investigative (5-Unit) Area	Groundwater extraction wells (3) – 1991 X-622 Groundwater Treatment Facility – 1991 (upgraded in 2001) Interim soil cover at X-231B – 1995 X-231A/X-231B multimedia caps – 2000 Groundwater extraction wells (11) – 2002 Groundwater extraction well (1) – 2009 Removal of contaminated soil at former X-770 Building – 2010
Quadrant I X-749A Classified Materials Disposal Facility	Cap – 1994
Quadrant II Quadrant II Groundwater Investigative (7-Unit) Area	Operation of X-700 and X-705 building sumps – 1989 X-622T Groundwater Treatment Facility – 1992 Removal of X-720 Neutralization Pit – 1998 Removal of X-701C Neutralization Pit – 2001 Removal of contaminated soil near X-720 Neutralization Pit – 2001 X-627 Groundwater Treatment Facility – 2004 (replaced the X-622T facility) Enhanced anaerobic bioremediation – 2011
Quadrant II X-701B Former Holding Pond	X-237 Groundwater Collection System – 1991 X-624 Groundwater Treatment Facility – 1991 (upgraded 2006) Extraction wells (3) – 1993 (removed 2009-2011) X-623 Groundwater Treatment Facility – 1993 X-701B sump – 1995 Groundwater remediation by oxidant injection – 2008 Groundwater and soil remediation by oxidant mixing – 2011

Table 3.1. Remedial actions at PORTS in groundwater monitoring areas (continued)

Quadrant/monitoring area	Remedial action/year completed
Quadrant III X-740 Former Waste Oil Handling Facility Area	Phytoremediation – 1999 Oxidant injections – 2008 Enhanced anaerobic bioremediation – 2011
Quadrant IV X-611A Former Lime Sludge Lagoons	Soil cover – 1996 Prairie vegetation planted – 1997
Quadrant IV X-735 Landfills	Cap on northern portion – 1994 Cap on southern portion – 1998
Quadrant IV X-734 Landfills	Cap on X-734B Landfill (Phase I) – 1999 Cap on X-734 and X-734A Landfills (Phase II) – 2000
Quadrant IV X-533 Former Switchyard Complex	Contaminated soil removal – 2010

The most recent five-year review for the X-749/X-120 groundwater plume found that the remedial actions were working effectively to meet the remedial action objectives for the X-749/X-120 groundwater plume (DOE 2016c). The next review of the remedial actions implemented for the X-749/X-120 groundwater plume will be submitted to Ohio EPA in 2021.

A potential source area to the X-749/X-120 groundwater plume was identified recently north of the X-749 Landfill. This area has been investigated as part of the *Deferred Units RCRA Facility Investigation/ Corrective Measures Study Work Plan for Solid Waste Management Units* (DOE 2015a).

Chapter 6, Section 6.4.1.3 and Figure 6.2, provide additional information about the 2019 groundwater monitoring results for the X-749/X-120 groundwater plume.

3.3.1.2 PK Landfill

The remedial actions required by the PK Landfill Decision Documents consisted of the continued operation of the eastern groundwater collection system installed in 1994 and construction of an engineered cap that meets the RCRA Subtitle D and related requirements (Ohio EPA 1996a and U.S. EPA 1997). In addition, the southeastern groundwater collection system was constructed in 1997 to contain surface seeps, groundwater from the southern slope of the PK Landfill, and the groundwater plume migrating toward Big Run Creek from the X-749 Landfill.

The most recent five-year review for the PK Landfill found that the corrective actions implemented at the PK Landfill (the groundwater collection systems, landfill cap, and institutional controls) were continuing to achieve corrective action objectives by eliminating exposure pathways and reducing the potential for contaminant transport (DOE 2018d). Concentrations of many of the contaminants detected in the PK Landfill wells, sumps, and manholes have decreased. The next review of the remedial actions implemented at the PK Landfill will be submitted to Ohio EPA in 2023.

Chapter 6, Section 6.4.2.1 and Figure 6.2, provide 2019 groundwater monitoring results for the PK Landfill area.

3.3.1.3 Quadrant I Groundwater Investigative (5-Unit) Area

Remedial actions identified for the Quadrant I Groundwater Investigative (5-Unit) Area (Chapter 6, Figure 6.3) are: 1) installation of multimedia caps over the X-231A and X-231B Oil Biodegradation Plots; and 2) installation of 11 additional groundwater extraction wells to extract contaminated groundwater for treatment in the X-622 Groundwater Treatment Facility (Ohio EPA 2001). The caps were constructed in 2000 and operation of the groundwater extraction wells began in 2002. In 2009, an additional extraction well was installed south of the X-326 Process Building to control and remediate a newly identified source of TCE beneath the building. Table 3.1 lists the remedial actions completed for the Quadrant I Groundwater Investigative (5-Unit) Area.

The most recent five-year review of both the groundwater extraction system for the Quadrant I Groundwater Investigative (5-Unit) Area and the multi-layered caps for the X-231A and X-231B Oil Biodegradation Plots found that the remedial actions implemented for the X-231A and X-231B Oil Biodegradation Plots and the Five-Unit Groundwater Investigative Area (the multimedia caps and groundwater extraction system) were continuing to eliminate potential exposure pathways to contaminants, control migration of the groundwater plume, and remove volatile organic compounds (VOCs) from groundwater (DOE 2018e). The next review of the remedial actions implemented at the Quadrant I Groundwater Investigative (5-Unit) Area and X-231A/B Oil Biodegradation Plots will be submitted to Ohio EPA in 2023.

Chapter 6, Section 6.4.3.1 and Figure 6.3, provide information on the groundwater monitoring completed in the Quadrant I Groundwater Investigative (5-Unit) Area during 2019.

3.3.2 Quadrant II

The *Quadrant II Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 2001 (DOE 2001). After approval of the document, however, Ohio EPA requested an amendment to the approved study to address additional remedial alternatives for the X-701B area. Amendments were submitted in 2001 and 2002. In 2003, Ohio EPA informed DOE that a separate Decision Document would be prepared for the X-701B area, and the X-701B Decision Document was issued in 2003 (Ohio EPA 2003).

Chapter 6 provides 2019 groundwater monitoring results for the following areas in Quadrant II that require groundwater monitoring: Quadrant II Groundwater Investigative (7-Unit) Area (Section 6.4.5.1 and Figure 6.4), X-701B Former Holding Pond (Section 6.4.6.1 and Figure 6.5), and X-633 Former Recirculating Cooling Water Complex (Section 6.4.7.1 and Figure 6.6).

3.3.2.1 Quadrant II Groundwater Investigative (7-Unit) Area

A number of deferred units are in the groundwater plume in the Quadrant II Groundwater Investigative (7-Unit) Area (Chapter 6, Figure 6.4). A special investigation conducted in 2009, which sampled soil and groundwater, identified areas of higher TCE concentrations that appeared to be associated with continuing sources of groundwater contamination in the southeastern portion of the plume. In 2010, Ohio EPA approved an interim remedial measure (IRM) for this area called enhanced anaerobic bioremediation. Enhanced anaerobic bioremediation utilizes injections of fermentable carbon compounds such as sodium lactate (a common ingredient in soaps and face creams) to provide additional food for naturally-occurring microorganisms in soil that degrade TCE to harmless substances. The project began in 2010 and was completed in 2013.

The *Final Report for the 7-Unit Interim Remedial Measure* was submitted to Ohio EPA in 2014 (DOE 2014a). Overall, the results indicated that appropriate conditions could be established at the site to degrade TCE despite the high TCE concentrations in soil and groundwater. Enhanced anaerobic bioremediation successfully reduced TCE to *cis*-1,2-dichloroethene, and with bioaugmentation, some of

the *cis*-1,2-dichloroethene was converted to ethane. The report concluded that after the six injection events plus a bioaugmentation event (injection of additional microorganisms that degrade VOCs), overall there was not a measureable reduction in the average concentration of TCE in groundwater, most likely due to the potential presence of dense non-aqueous phase liquid TCE in the area, and the decision was made to conclude the IRM.

DOE and Ohio EPA have agreed that selection of a remedial action for the Quadrant II Groundwater Investigative (7-Unit) Area will be incorporated into the deferred units preferred plan and decision document.

Chapter 6, Section 6.4.5.1 and Figure 6.4, provide information about the groundwater monitoring completed at the Quadrant II Groundwater Investigative (7-Unit) Area during 2019.

3.3.2.2 X-701B Former Holding Pond

Remedial actions required by the Decision Document for X-701B, issued in 2003, include groundwater remediation by injection of a chemical oxidant (Ohio EPA 2003). The oxidant injections required by the Decision Document took place between 2006 and 2008. Following the end of the injections in 2008, an independent review of the X-701B project was completed by DOE Headquarters to evaluate remediation results and provide recommendations for a path forward.

The review of the X-701B oxidant injections determined that the method used to inject oxidant into the contaminated area was not able to address contaminants in the deepest portion of the contaminated soil. If contaminants remained in this portion of the soil, they would continue to be released into the groundwater plume. Therefore, DOE proposed an IRM to excavate soil in the western portion of the X-701B plume area and directly mix oxidant into the contaminated soil. The IRM began in December 2009 and was completed in January 2011. Chapter 6, Section 6.4.6.1 and Figure 6.5, provide information about the groundwater monitoring completed at the X-701B Former Holding Pond during 2019.

3.3.2.3 X-633 Former Recirculating Cooling Water Complex

The X-633 Recirculating Cooling Water Complex was demolished in 2010. A RCRA investigation of soil and groundwater in the area was implemented in 2011. Areas of soil potentially contaminated with metals were identified, but the higher concentrations of metals may have been present in these areas (15 to 20 ft below ground surface) due to naturally-occurring variations in the geology of the area.

Chromium and TCE were detected in groundwater at concentrations above the preliminary remediation goals during the 2011 RCRA investigation for the X-633 area. DOE agreed to sample eight wells around the area annually to continue evaluation of chromium and TCE in groundwater at this area. The *2019 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* provides the data for this monitoring (DOE 2020).

3.3.3 Quadrant III

The *Quadrant III Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 1998 (DOE 1998a). The Decision Document for Quadrant III, issued in 1999, required phytoremediation of the groundwater plume near the X-740 Waste Oil Handling Facility (Ohio EPA 1999a).

Over 700 hybrid poplar trees were planted on a 2.6-acre area above the X-740 groundwater plume (Chapter 6, Figure 6.8) in 1999. Evaluation reports for this remedial action were completed in 2003 and 2007. The reports concluded that the phytoremediation system had not performed as expected to remove TCE from groundwater in this area (DOE 2003 and DOE 2007b).

In response to Ohio EPA concerns about the performance of the phytoremediation system, DOE implemented additional remedial activities for the X-740 area. Three rounds of oxidant injections were completed in 2008 to remove TCE from the groundwater. Although the oxidant briefly reduced TCE concentrations detected in some of the wells, TCE concentrations in groundwater returned to typical levels in 2009.

In 2010, Ohio EPA approved a pilot study of enhanced anaerobic bioremediation for the X-740 area. Section 3.3.2.1 provides additional information about enhanced anaerobic bioremediation. Emulsified oil, a slow-acting fermentable carbon compound, was injected into the selected portions of the X-740 groundwater plume during December 2010 and January 2011. TCE has decreased in wells within the area of the groundwater plume that was treated during the pilot study (see Chapter 6, Section 6.4.9.1 and Figure 6.8).

The *Final Report for the X-740 Pilot Study* (DOE 2016a) was approved by Ohio EPA in 2016. A summary of the results of the pilot study is included in the *Deferred Units RCRA Facility Investigation/Corrective Measures Study Report* (DOE 2017a).

Chapter 6 provides 2019 groundwater monitoring results for the following areas in Quadrant III that require groundwater monitoring: X-616 Former Chromium Sludge Surface Impoundments (Section 6.4.8.1 and Figure 6.7) and X-740 Former Waste Oil Handling Facility (Section 6.4.9.1 and Figure 6.8).

3.3.4 Quadrant IV

The *Quadrant IV Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 1998 (DOE 1998b). DOE received the Decision Document for Quadrant IV in 2000 (Ohio EPA 2000). No new remedial actions were required in Quadrant IV (remedial actions had already taken place at the X-344D Hydrogen Fluoride Neutralization Pit, X-735 Landfills, X-611A Former Lime Sludge Lagoons, and X-734 Landfills).

Chapter 6 provides 2019 groundwater monitoring results for the following areas in Quadrant IV that require groundwater monitoring: X-611A Former Lime Sludge Lagoons (Section 6.4.10.1 and Figure 6.9), X-735 Landfills (Section 6.4.11.1 and Figure 6.10), X-734 Landfills (Section 6.4.12.1 and Figure 6.11), X-533 Former Switchyard Complex (Section 6.4.13.1 and Figure 6.6), and X-344C Former Hydrogen Fluoride Storage Building (Section 6.4.14.1 and Figure 6.12).

3.3.4.1 X-611A Former Lime Sludge Lagoons

Ohio EPA and U.S. EPA issued a Decision Document for the X-611A area (Chapter 6, Figure 6.9) in 1996, which required a soil cover over the former lagoons and establishment of a prairie habitat (Ohio EPA 1996b). The soil cover and planting of the prairie were completed in 1997. The most recent five-year review found that the soil cover and prairie habitat were meeting the remedial action objectives for this unit by eliminating exposure pathways to the contaminants in the sludge at this area (DOE 2018c). The next review of the remedial actions implemented at the X-611A area will be submitted to Ohio EPA in 2023.

3.3.4.2 X-734 Landfills

Ohio EPA issued a Decision Document for the X-734 Landfills (Chapter 6, Figure 6.11) in 1999 (Ohio EPA 1999b). Remedial actions required by the Decision Document included construction of a multimedia cap over the northern portion of the landfills and a soil cap over the southern portion of the area. These caps were installed in 1999 and 2000.

The most recent five-year review found that the landfill caps have achieved remedial action objectives by isolating contaminants in soil and sediment from potential receptors (DOE 2018f). The caps were also

preventing contaminants from migrating from soil to groundwater and from groundwater to surface water. The next review of the remedial actions implemented at the X-734 Landfills will be submitted to Ohio EPA in 2023.

3.3.4.3 X-630 Former Recirculating Cooling Water Complex

The X-630 Recirculating Cooling Water Complex, located in Quadrant IV within Perimeter Road and west of the X-533 Switchyard Complex, was removed during 2011 as part of D&D. A RCRA investigation of soil and groundwater at the X-630 Recirculating Cooling Water Complex was implemented in 2011.

Areas of soil potentially contaminated with metals were identified, but the higher concentrations of metals may have been present in these areas (15 to 20 ft below ground surface) due to naturally-occurring variations in the geology of the area.

Chromium and TCE were detected in groundwater at concentrations above the preliminary remediation goals during the 2011 RCRA investigation for the X-630 area. DOE agreed to sample four wells around the area annually to continue evaluation of chromium and TCE in groundwater at this area. The *2019 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* provides the data for this monitoring (DOE 2020).

3.4 WASTE MANAGEMENT PROGRAM

The DOE Waste Management Program directs the safe storage, treatment, and disposal of waste generated by past and present operations and from current D&D and Environmental Restoration projects at PORTS. Waste managed under the program is divided into the following seven categories, which are defined below:

- *LLW* – radioactive waste not classified as high level or transuranic waste.

- *Hazardous (RCRA) waste* – waste listed under RCRA or waste that exhibits one or more of the four RCRA hazardous characteristics: ignitability, corrosivity, reactivity, and toxicity. Universal waste, which includes common items such as batteries and light bulbs, is a subset of RCRA waste that is subject to reduced requirements for storage, transportation, and disposal or recycling.

- *PCB wastes* – waste containing PCBs, a class of synthetic organic chemicals. Disposal of PCB-contaminated materials is regulated under TSCA.

- *RCRA/low-level radioactive mixed waste* – waste containing both hazardous and radioactive components. The waste is subject to RCRA, which governs the hazardous components, and to the Atomic Energy Act that governs the radioactive components.

- *PCB/low-level radioactive mixed waste* – waste containing both PCB and radioactive components. The waste is subject to TSCA regulations that govern PCB components, and to the Atomic Energy Act that governs radioactive components.

- *PCB/RCRA/low-level radioactive mixed waste* – waste containing PCB and radioactive components that is also a RCRA hazardous waste. The waste is subject to RCRA regulations, TSCA regulations that govern PCBs, and to the Atomic Energy Act that governs radioactive components.

- *Solid waste* – "Solid wastes," as defined by Ohio EPA, can be solids, liquids, sludges, or other materials. These wastes can include waste from construction or demolition activity, industrial waste, sanitary waste, and office waste (subject to definitions from Ohio EPA). Waste contaminated with asbestos may also be included in this category if it is not included in any of the categories listed above (PCB, RCRA, and/or LLW).

Waste management requirements are varied and are sometimes complex because of the variety of waste streams generated by DOE activities at PORTS. DOE Orders, Ohio EPA regulations, and U.S. EPA regulations must be satisfied to demonstrate compliance with waste management activities. Additional policies have been implemented for management of radioactive, hazardous, and mixed wastes. These policies include the following:

- minimizing waste generation;
- characterizing and certifying wastes before they are stored, processed, treated, or disposed;
- pursuing volume reduction (such as blending and bulking) as well as on-site storage in preparation for safe and compliant final treatment and/or disposal; and
- recycling.

DOE is placing increased emphasis on the evaluation of materials generated by D&D for reuse or recycling. An agreement between DOE and the Southern Ohio Diversification Initiative (SODI) allows DOE to transfer excess equipment, clean scrap materials and other assets to SODI. SODI first attempts to reuse the excess equipment and property within the local community. Pursuant to the agreement, if SODI is unable to place the property for reuse in the local community, SODI may sell the property. When SODI sells the property, the proceeds are used to support economic development in the southern Ohio region. In 2019, SODI received approximately 416 tons of materials from PORTS, primarily recyclable metals, recyclable oil, and reusable equipment.

In 2019, FBP shipped approximately 2051 tons of materials to off-site facilities for treatment, disposal, recycling, or reuse (see Table 3.2).

The following materials were sent off-site by FBP for recycling in 2019:

- aluminum cans: 4000 lbs
- aerosol cans: 432 lbs
- batteries: 40,775 lbs
- electronic materials (computer equipment, circuit boards, etc.): 18,407 lbs
- used oil: 4881 lbs
- light bulbs: 5720 lbs
- thermometers containing mercury: 37 lbs
- paper/cardboard: 56,000 lbs
- plastic bottles: 27,500 lbs
- recyclable materials to SODI (excess equipment and materials, recyclable metals, recyclable oil, etc.): 416 tons.

Table 3.2. Waste Management Program off-site treatment, disposal, and recycling accomplishments for 2019

Waste type	Waste stream	Quantity (lbs[a])	Treatment or disposal, facility
RCRA	Aerosol cans, broken lead acid batteries, and used oil filters	2862	Environmental Quality Co.
RCRA/LLW/ PCB	Ballasts and other metals	1356	EnergySolutions Clive, UT
LLW	Used oils	6119	Diversified Scientific Solutions
LLW	Contaminated liquids, soil, and sludge	1604	EnergySolutions Clive, UT
LLW	Contaminated paper	2225	EnergySolutions Bear Creek TN
LLW	D&D waste, uranium materials, scrap metal, and other solids	2,038,213	Nevada National Security Site
RCRA/LLW	Contaminated liquids, used carbon, and other solids	5433	Diversified Scientific Solutions
RCRA/LLW	D&D waste, soil, lab wastes, and other materials	60,626	EnergySolutions Clive, UT
RCRA/LLW	Contaminated debris and other solids	121	Perma-Fix Florida
RCRA/LLW	Contaminated scrap metal from the X-326 Process Building	117	Waste Control Specialists
LLW/PCB	Oil/water mixtures contaminated with PCBs	337	Diversified Scientific Solutions
LLW/PCB	Debris and metal contaminated with PCBs	1137	EnergySolutions Clive, UT
LLW/PCB	D&D waste and other solid debris contaminated with PCBs	320,611	Nevada National Security Site
Solid waste	Construction debris, office waste, and other solid materials	670,640	Rumpke/Pike Sanitation Landfill
-	Recyclable aluminum cans, batteries, electronic materials, plastic, batteries, light bulbs, etc. (see Section 3.4)	157,752	Various (not including SODI)
-	Reusable or recyclable materials transferred to SODI (see Section 3.4)	832,677	-

[a]lbs in net weight (waste only).

3.5 ENVIRONMENTAL SUSTAINABILITY PROGRAM

DOE is committed to reducing potential environmental risks, costs, wastes, and future liability by effectively integrating environmental sustainability principles into DOE activities at PORTS in a cost effective and environmentally conscious manner. The DOE Environmental Sustainability Program is a balanced, holistic approach that links planning, budgeting, measuring, and improving PORTS overall environmental performance to specific goals and outcomes. The *Fiscal Year 2020 Site Sustainability Plan* describes the Environmental Sustainability Program and integrates the tenets of an EMS (see Chapter 2, Section 2.3.6) (DOE 2019a). The Environmental Sustainability Program includes elements of pollution prevention, waste minimization, affirmative procurement, sustainable design, and energy and water efficiency.

DOE is committed to minimizing and/or eliminating the amounts and types of wastes generated and to achieving reduced life cycle costs for managing and dispositioning property and wastes during all DOE projects and activities at PORTS.

Effective environmental sustainability management begins with an integrated strategy. In order to achieve the objectives and targets of the Environmental Sustainability Program, DOE has developed and implemented a well-defined strategy for setting, updating, and achieving objectives and targets in line with the EMS and in conjunction with DOE pollution prevention goals. The broad objectives are core elements of the Environmental Sustainability Program. These objectives, presented below, are both qualitative and quantitative and reduce the life cycle cost and liability of DOE programs and operations at PORTS:

- eliminating, minimizing, or recycling wastes that would otherwise require storage, treatment, disposal, and long-term monitoring and surveillance;
- eliminating or minimizing use of toxic chemicals and associated environmental releases that would otherwise require control, treatment, monitoring, and reporting;
- maximizing the use (procurement) of recycled-content materials and environmentally preferable products and services, thereby minimizing the economic and environmental impacts of managing by-products and wastes generated in the conduct of mission-related activities; and
- reducing the life-cycle cost of managing personal property at PORTS.

DOE continued energy reduction programs at PORTS that focused on accomplishing the goals of Executive Order 13834, *Efficient Federal Operations*. Executive Order 13834 provides goals for greenhouse gas emission reductions and environmental sustainability (including energy and water efficiency; waste and pollution prevention; and electronics stewardship).

In support of this Executive Order, the *Fiscal Year 2020 Site Sustainability Plan for the Portsmouth Gaseous Diffusion Plant* provides goals and progress through fiscal year 2019 for reductions in greenhouse gas emissions, water consumption, recycling/waste diversion, electronic stewardship, and other areas (DOE 2019c). The following accomplishments were listed for fiscal year 2019:

- a decrease of 76.2% in greenhouse gas emissions (primarily associated for electricity consumption) versus the fiscal year 2008 baseline emissions.
- a decrease in water consumption of 24% in fiscal year 2019 versus fiscal year 2018.

- Approximately 61.4% of nonhazardous waste was diverted from disposal at an off-site landfill (the waste was recycled).

- Approximately 38.7% of construction and demolition materials were diverted from off-site disposal (the materials were recycled).

PORTS was recognized by the Green Electronics Council in May 2019 for excellence in sustainable procurement of information technology products with a 3-Star Electronic Product Environmental Assessment Tool (EPEAT) Purchasing Award.

3.6 PUBLIC AWARENESS PROGRAM

A comprehensive community relations and public participation program is in place at PORTS. The purpose of the program is to foster a spirit of openness and credibility between PORTS officials and local citizens, elected officials, business, media, and various segments of the public. The program also provides the public with opportunities to become involved in the decisions affecting environmental issues at PORTS. Contact information for the organizations that provide PORTS information to the public is listed below.

The Environmental Information Center provides public access to documents used to make decisions on remedial actions being taken at PORTS. The Information Center is located just north of PORTS at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661.

The PORTS Site Specific Advisory Board, comprised of citizens from the local area, provides public input and recommendations to DOE on D&D, environmental remediation, waste management, and related issues at PORTS. Regularly scheduled meetings that are open to the public are held between DOE and the PORTS Site Specific Advisory Board. Additional information about the PORTS Site Specific Advisory Board can be obtained at energy.gov/pppo/ports-ssab or by calling 740-289-5249.

The PORTS Envoy Program matches employee volunteers with community stakeholders such as families living next to DOE property, community groups, and local government organizations. The envoys communicate information about PORTS D&D and other site issues to the stakeholders and are available to answer stakeholder questions about PORTS.

PORTS Environmental Information Center **740-289-8898** **Hours: 9-12 (Mon-Tue)** **12-4 (Wed-Thu)** **or by appt** **Email: portseic@ports.pppo.gov**	**energy.gov/pppo/portsmouth-environmental-information-center**
Online Document Repository	**eic.ports.pppo.gov**
DOE Site Office **740-897-5010**	**energy.gov/pppo**
FBP Public Affairs **740-897-2964**	**fbportsmouth.com**
PORTS Environmental Data (PEGASIS)	**pegasis.ports.pppo.gov/pegasis**
PORTS Virtual Museum	**portsvirtualmuseum.org**

The PORTS version of the PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS) allows the user to obtain PORTS off-site environmental monitoring data and display it on a local map that shows the locations the data were collected. Data from 2013 through the current ASER are available in PEGASIS.

Public open houses in neighboring communities are also held to keep the public informed and to receive their comments and questions. Periodically, fact sheets about major projects are written for the public. Additionally, notices of document availability and public comment periods, as well as other communications on the program, are regularly distributed to the local newspaper, the community relations mailing list, neighbors within 2 miles of the plant, and plant employees.

Helping to grow a science, technology, engineering, and math (STEM) environment for rural Appalachian schools is a primary activity for The Ohio University Voinovich School's PORTSfuture Program. Through a grant funded from the DOE Portsmouth/Paducah Project Office, PORTSfuture has been able to reach out to over 13,000 students in the four county area in Southern Ohio around PORTS. The PORTSfuture Program engages K-12 and college students in STEM activities focused on technology, energy, environment, entrepreneurship, and water quality issues. Outreach efforts have included in-class activities and curriculum, business pitch competitions, science fairs, summer STEM enrichment programs, and after school clubs.

The PORTSfuture Program includes a project in which local high school students produce a summary of the Annual Site Environmental Report for distribution to the public. The PORTS Annual Science Alliance event brings more than 1500 high school juniors to PORTS for an interactive science fair that includes scientific demonstrations and information related to careers in STEM fields. DOE and PORTS contractors also support the annual South Central Ohio Regional Science Bowl, an academic competition for middle school and high school students. Student teams answer questions about biology, chemistry, earth sciences, math, and physics with the regional winners advancing to the National Science Bowl in Washington, D.C. The DOE PPPO web site at energy.gov/pppo and portsfuture.com provide additional information about these projects.

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